

Claims

What is claimed is:

- 1) An apparatus for filtering fluids comprising:
 - an outer fluid container;
 - 5 a fluid inlet into the outer fluid container providing fluid into the outer fluid container;
 - a filter media bed within a filter media housing supported in the outer fluid container, wherein at least a portion of the housing is flexible and contains compressible filter media;
- 10 an opening in the housing for receiving fluid entering the outer fluid container; and
- a filtered fluid outlet for filtered effluent to exit the housing.
- 2) The apparatus of claim 1 wherein the flexible portion of the housing includes a flexible membrane supported upright in the outer fluid container for fluid to surround the housing and compress the compressible filter media.
- 15 3) The apparatus of claim 2 wherein the opening in the housing includes an upper perforated plate attached to the top of the housing.
- 4) The apparatus of claim 3 wherein the perforated plate receives fluid rising within the outer fluid container above the housing and upper plate.
- 20 5) The apparatus of claim 4 further comprising a lower perforated plate attached to the housing beneath the filter media bed.
- 6) The apparatus of claim 1 further comprising a closeable drain in the outer fluid container for controlling filling of the outer fluid container with fluid.

- 7) The apparatus of claim 2 further comprising an overflow outlet in the outer fluid container above the housing for excess flow to exit the outer fluid container.
- 8) The apparatus of claim 2 further comprising a filter media agitator provided to the housing for disturbing the filter media bed and expanding the housing to wash particulates out of the filter media bed and housing.
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- 9) The apparatus of claim 8 wherein the agitator is an air blower for circulating the filter media.
- 10) The apparatus of claim 9 further comprising:
10 an upper perforated plate attached to the top of the housing; and
 a lower perforated plate attached to the filter media housing beneath the filter media bed and above an outlet from the air blower.
- 11) The apparatus of claim 10 further comprising a backwash outlet in the outer fluid container for carrying out particulate wash fluid from the outer fluid container.
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- 12) The apparatus of claim 11 further comprising one or more backwash removal troughs on the upper perforated plate for directing particulate wash fluid from the plate and away from reentering the housing.
- 13) The apparatus of claim 1 wherein the compressible filter media includes at least one bundle of fibers including a fiber with at least two different component materials.
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- 14) The apparatus of claim 13 wherein the at least two different component materials include a polyester inner core and polypropylene sheath.

- 15) The apparatus of claim 13 wherein the at least two component materials include a nylon inner core and a polypropylene sheath.
- 16) The apparatus of claim 13 wherein the at least two different component materials are each selected from the group consisting of polyester, copolyester, polyactic acid, polytrimethylene terephthalate, polycyclohexanediol, terephthalate, polyethylene napthalate, high density polyethylene, linear low density polyethylene, polyethylene, polypropylene, nylon, polyvinylidene fluoride, polytetrafluoroethylene and polyurethane.
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- 17) The apparatus of claim 2 wherein the compressible filter media includes at least one bundle of fibers including a fiber with at least two different component materials.
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- 18) The apparatus of claim 17 wherein the at least two different component materials are each selected from the group consisting of polyester, copolyester, polyactic acid, polytrimethylene terephthalate, polycyclohexanediol, terephthalate, polyethylene napthalate, high density polyethylene, linear low density polyethylene, polyethylene, polypropylene, nylon, polyvinylidene fluoride, polytetrafluoroethylene and polyurethane.
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- 19) The apparatus of claim 2 wherein the housing includes an upper portion wider than a lower portion of the housing.
- 20) The apparatus of claim 2 wherein the compressible filter media is positioned to be compressed in a direction generally perpendicular to the direction of fluid flow through the housing.
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- 21) The apparatus of claim 1 wherein the filter media is positioned to be compressed in a direction non-parallel to the direction of fluid flow through the housing.
- 22) The apparatus of claim 21 wherein the filter media bed includes at least two compression zones.
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- 23) The apparatus of claim 22 wherein at least one of the compression zones includes filter media uncompressed by the housing.
- 24) A filter apparatus comprising:
 - an outer container;
 - 10 a filter media housing containing filter media within the outer container; fluid within the outer container and surrounding the filter media housing, wherein the fluid compresses at least a portion of the housing and filter media within the at least a portion of the housing;
 - 15 an unfiltered fluid opening into the flexible housing for allowing the fluid to be filtered; and
 - a filtered fluid outlet for filtered fluid to exit the housing.
- 25) The filter apparatus of claim 24 further comprising a filter media agitator for backwashing the filter media.
- 26) A method for filtering fluid comprising:
 - 20 providing fluid to be filtered against a flexible housing, wherein the flexible housing houses compressible filter media;
 - compressing the flexible housing with the fluid to compress the filter media; and

filtering the fluid through the filter media.

27) The method of claim 26 further comprising:

agitating the filter media to dislodge solids adhering to the media filtering of the fluid; and

5 removing effluent containing solids dislodged during the agitating of the filter media.

28) A fluid filtering apparatus comprising:

an outer container;

a fluid inlet into the outer container for providing fluid into the outer

10 container;

an inwardly flexible housing containing filter media within the outer container, wherein the inwardly flexible housing includes an opening for receiving fluid entering the outer container; and

a filtered fluid outlet for filtered fluid to exit the flexible housing, wherein

15 the flexible housing includes at least two different widths between the opening and the outlet.

29) The apparatus of claim 28 wherein the housing includes a first width near the opening that is wider than a second width near the outlet.

30) The apparatus of claim 29 wherein the housing is substantially tapered.

20 31) An apparatus for filtering fluids comprising:

an outer container;

compressible filter media housed within the outer container in at least a portion of a housing that is pliable and inwardly compressible;

an inlet for receiving a flow of fluid to be filtered into the housing;
fluid within the outer container and surrounding the housing, wherein the
fluid compresses the at least a portion of a housing that is pliable
and the compressible filter media in a non-parallel direction to the
direction of fluid flow through the housing; and
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an outlet for filtered fluid to exit the housing.

32) A method for filtering fluid comprising:
receiving fluid to be filtered in a housing, wherein at least a portion of the
housing is inwardly compressible and said inwardly compressible
10 portion contains compressible filter media;
compressing the housing in a direction non-parallel to the direction of fluid
flow through the filter media; and
filtering fluid through the filter media.

33) The method of claim 32 wherein the housing includes a flexible membrane.

15 34) The method of claim 32 wherein the filter media is included in a bed of filter
media, the bed including at least two different compression zones.

35) The method of claim 34 wherein at least one compression zone is
uncompressed.

36) The method of claim 32 wherein the fluid flow is in a top to down direction.

20 37) An apparatus for filtering fluids comprising:
an inlet for delivering fluid to be filtered to a filter media bed, wherein at
least a portion of the bed is compressible;

a housing containing the portion of the bed that is compressible in at least a flexible portion of the housing; and
an outlet for conveying filtered fluid from the filter media.

38) The apparatus of claim 37 further comprising:
5 a covering over the housing; and
 a spacing gap provided in the housing between the covering and surface
 of the filter media bed initially contacting the fluid to be filtered.

39) The apparatus of claim 37 wherein the filter media bed includes at least one
filter bed portion uncompressed by the flexible portion of the housing.

10 40) The apparatus of claim 37 wherein the filter media bed includes two or more
distinct compression zones.

41) The apparatus of claim 40 wherein at least one of the compression zones is
uncompressed by the flexible portion of the housing.

42) The apparatus of claim 37 wherein the filter media bed is positioned for fluid to
15 be filtered to flow through the filter media bed in a direction non-parallel to the
direction of the compression of the compressible portion of the filter media
bed.

43) The apparatus of claim 42 wherein the housing is a flexible membrane.

44) The apparatus of claim 38 wherein the housing is a flexible membrane.

20 45) A method for filtering fluid comprising:
 receiving fluid to be filtered in a housing, wherein the housing contains
 compressible filter media;

compressing at least a portion of the filter media in a direction non-parallel to the direction of the flow of fluid to be filtered through the filter media; and

filtering the fluid through the media.

5 46) The method of claim 45 wherein the least a portion of the filter media is compressed by at least a portion of the housing.

47) The method of claim 46 wherein the at least a portion of the filter media is compressed in a direction generally perpendicular to the flow of fluid through the housing.

10 48) A method for filtering fluid comprising:

receiving fluid to be filtered in a housing, wherein the housing contains compressible filter media;

compressing at least a portion of the filter media to create two or more distinct compression zones; and

15 filtering the fluid through the media.

49) The method of claim 48 wherein the least a portion of the filter media is compressed by at least a portion of the housing.

50) The method of claim 49 wherein the at least a portion of the filter media is compressed in a direction generally perpendicular to the flow of fluid through
20 the housing.